Integrating a Natural Language Message Pre-Processor with UIMA

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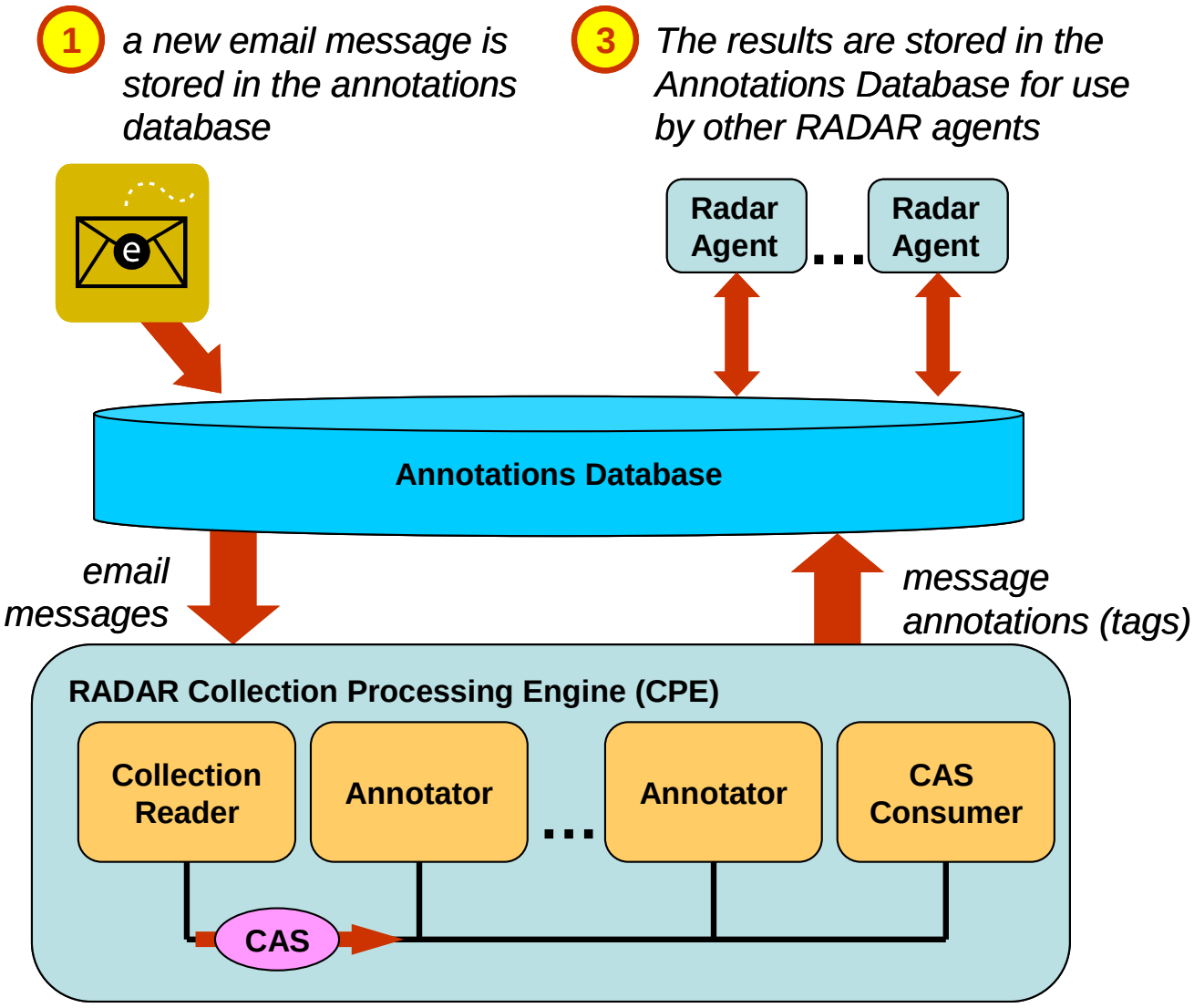
Project Context

- RADAR: Goal is to help desktop user
  - Personal Assistant that Learns (PAL)
  - Test environment: conference planning
  - Primary input: email messages!
- Requirements include:
  - Preprocessing of email messages
    - Segmentation, typo correction, etc.
    - Syntactic parsing
    - General and domain-specific semantic interpretation
    - Domain-specific task request extraction
  - Original content preserved

The RADAR CPE



Radar Annotator implementation

- Three varieties of implementation:
  - MinorThird toolkit (William Cohen)
  - Java code
  - Client/server (primarily for legacy and external vendor software) with UIMA wrapper for client

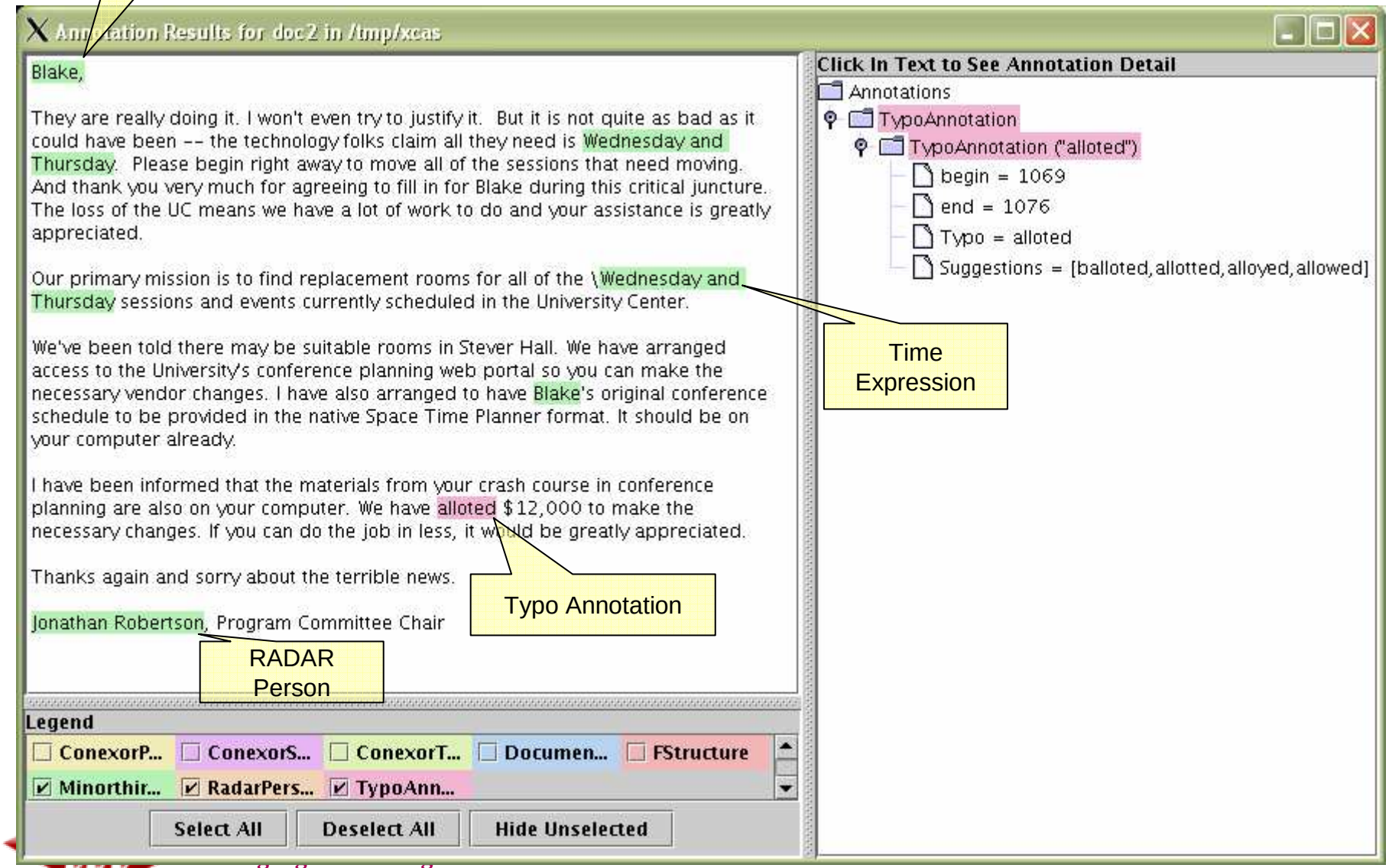
Radar Annotators: list

- In order:
- Collection Reader
  Email Opening
  Conexor parser
  Temporal Expr.
  F-Structure
  GFrame
  DFrame

- In between:
- Task
  RADAR Person
  SCONE Semantics
  Person Name
  SCONE Implicit
  Space Request
  Typo

- Last:
- CAS Consumer

Example Document



Sample Annotations: TempEx

String	Offset	Length
of the summer	73	13
This summer	175	11
three days	359	10
1 week	493	6
Starting May 10)	774	16
July 4	1971	6
INDEPENDENCE DAY	1939	16

Sample Annotations: Typo

String	Offset	Length	Value
teh	60	3	the, eh,…
brousing	20	8	rousing, browsing
bris	16	4	…brisk...
midle	36	5	middle,…
infor	117	5	inform,…
committe	83	8	committed
fed	286	3	fled

Sample Annotations: DFrame

String	Offset	Len	Value
Which room is the first event in?	14	33	((dframe … (subj ((POS N) (attr ((POS NUM) (function attr) (ortho first) (root first) …

Sample Annotations: BriefingReq

String	Offset	Len	Value
I need a progress report on yesterday NOW	0	43	<node id="request11 72260778347" … </node>
please send me a campus map sooon. -- chian	0	44	<node id="request11 72261238858" … </node>

%	Time(ms)	s/doc	Annotator
65.27	5310311	21.24	DFrame
24.60	2001145	8.00	GFrame
			RADAR Person
			SCONE Sem.
			Temporal Expr.
1.03	83563	0.33	Person Name
0.71	57742	0.23	SCONE Impl.
0.54	44187	0.18	F-Structure
0.18	14889	0.06	Email Opening
0.17	13513	0.05	SpaceRequest
0.17	13445	0.05	Conexor
0.07	5835	0.02	Typo
0.06	4746	0.02	CAS Consumer
0.03	2725	0.01	Collection Reader
0.03	2415	0.01	Task
100.00	8136349	32.55	Entire Pipeline

Expensive rule-based computations (structural transformation rules and KB lookups)

[sample: 250 randomly selected messages]

7. Add domain semantics
6. Add general semantics
Label known person names
Domain KB interpretation
4. Add anchored time labels
Label any person name
Add domain KB features
5. Label grammatical roles
2. Label salutations in email
Label space requests
3. Segmentation, parsing
Label typo fixes
8. Write to ADB
1. Read from ADB
Label task requests

Annotator Run-Time

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Sample Annotator Precision

Annotator	% Correct	% Partly Correct
Vendor Order Annotator	100%	--
Task Annotator	73%	77%
Person Name Annotator	76%	85%
Space Request Annotator	64%	79%

[sample: 50 randomly selected messages]

Since the RADAR context is machine assistance in a human task, these should also be correlated with their effect on human task performance (currently assessed end-to-end for full system).

Cost of Adoption

- 1.5 months FTE to wrap and integrate 15 NLP components
  (programmer already familiar with UIMA)

Issues/Future Work

- Better robustness/decoupling
  - Require standard service interfaces for NLP components
  - Wrap as UIMA-EE (UIMA-AS) services
- Better transparency
  - Hard to tell whether a service is dead or just working hard
  - Need better logging/communication with services
- Better speed
  - Optimize rule-based engines
  - Provide multiple service instances for time-consuming services

Questions?

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